Midwest Engineer

SERVING THE ENGINEERING PROFESSION

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REINFORCED CONCRETE — PAGE THREE
WSE MEETINGS — PAGE TWO

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COVER STORY

Who's for ice skating?" That might well be the call by WSE members at Headquarters some day in the near future. A proposal to build an artificial ice rink near Headquarters is now under consideration. It would be located east of Michigan between Jackson blvd. and Van Buren. The largest artificial rink in the world, it would cost an anticipated $700,000. Several hundred skaters could be accommodated at one time. Our cover shows an artist's conception of how the rink would look.

—Chicago Park District picture

November 22, WSE General Program

Speaker: Dr. David Slepian, research mathematician, Bell Telephone Laboratories, Inc.

Subject: "Information Theory." The general structure of the theory and its primary results will be discussed in non-mathematical language. The basic concept on which the theory is built, namely a quantitative measure of the information content of messages, will be examined in detail. Examples will include samples of random English and music, application of the theory to card tricks, guessing games, and the like.

November 24, Noon Luncheon Meeting

Speaker: Dr. Gerhard Nothman, manager of mechanism, Dynamic Research Dept., Armour Research Foundation.

Subject: "News on the Drawing Board." Everyday you hear about some new device that has just come into being. You also know that there are many more such devices still in the designing stage, soon to be put into production. What are some of the things still "on the board?" Come to this meeting and you'll find out.

November 29, WSE Annual Fall Dinner

See page 8 of this issue for all the information.

December 1, Noon Luncheon Meeting

Speaker: Karl H. Schattke, chief engineer, Naess & Murphy, architects and engineers.

Subject: "Chicago's New Prudential Building." Everyone —you, me, and the man next door—is talking about the new building rising on the lake front just east of WSE headquarters. It has the largest electrical design load, the heaviest air conditioning load, and the highest lighting intensity of any building in the U.S. Mr. Schattke will cover the special design features of this, the fifth largest office building in America.

December 6, WSE General Program

Speaker: George L. Jackson, WSE trustee, and chief engineer for the Illinois State Toll Highway Commission.

Subject: "Toll Roads for Illinois, a Progress Report." This will be an up-to-the-minute report on a subject of vital interest to all road users, engineers in particular. Mr. Jackson will give a factual picture of the network of ultra-modern highways proposed for Illinois. The preliminary studies have been completed, and the subject is especially timely.

December 8, Joint Meeting, WSE-IIT

Speaker: Professor Garrett Birkhoff, chairman, Department of Mathematics, Harvard University.

Subject: "Helmholtz and Taylor Instability." This is a joint meeting of the Western Society and the Illinois Institute of Technology Colloquim. The topic has recently yielded several items of much physical interest.

December 8, Noon Luncheon Meeting

Speaker: James Arnold, affiliated with the Research Institute, University of Chicago.

Subject: "The Radiocarbon Calendar." The use of natural radioactivities to measure geologic time, dates back to the early 1900's. Radioactive carbon 14's occurence in nature, due to the action of cosmic rays, gives us an accurate calendar of man's past, since its half-life of 5600 years coincides with the span of historic time. New techniques have been developed to measure the very weak activity. They use the screen wall counter. The speaker will describe these techniques; also some of the striking results achieved with them.

December 14, Communications Section Meeting

Speaker: K. V. Glentzer, radio and special services engineer, Illinois Bell Telephone Co.

Subject: "Maritime Radio Communications on the Great Lakes and Inland Waterways." With two of the leading ports of the U.S. located on the Great Lakes, radio-telephone communications on the lakes have become a leading factor in operations of maritime traffic there. Mr. Glentzer will discuss the location of the various stations, and the service given through them.

An early history of the Construction and Design of

Reinforced Concrete

By Benjamin A. Wasil, MWSE

In 1878 at the Paris Exposition a Jean Monier received the First Class Diploma of Honor. This esteemed honor was bestowed on Monier for his invention of the then called "Monier System." Jean Monier lived at the beginning of his career in 1867 near Paris. He was a gardener and it was his intention to build large and strong tree-pots, since tree-pots were much in use then. He imbedded wire nets in concrete in building the tree-pots and thus invented the "Monier System." Thus, is generally attributed the beginning of reinforced concrete.

However, there is much evidence that the use of reinforced concrete, however minor and insignificant, precedes Monier and that reinforced concrete systems developed both in England and in the United States simultaneously and independently of Monier.

It has been intimated that Monier knew of an earlier English patent granted to Lambot of France in 1855 who made a reinforced concrete boat of small dimensions. This boat was exhibited in the Paris Exposition of 1875.

An English patent was granted to Wilkinson in 1854 which uses a wire rope which is ". . . secured at its extremities at each line of support by imbedding it in the mixture or concrete while in a soft state, and forming the ends into loops, or by opening out the strands and hurling them in various directions, which renders it so secure as not to be drawn out under any force short of the breaking weight of the rope. For ordinary dwelling houses, I propose placing such wire ropes about nine inches apart, and to have a full depth of floor of one-sixteenth the span."

Francois Coignet was granted an English patent in 1855 in which he applied the principles of reinforced concrete in the construction of beams, arches, pipes, etc. Coignet exhibited some of his works at the same time Monier first showed his works, at the Paris Exposition of 1867.

In 1867, the date of Monier's first patent, Mr. Scott, a Lt. Colonel of Engineers of the British Army, obtained a patent for a concrete floor that would dispense with the use of joists and would make use of wrought-iron tie-rods extending from wall to wall. "The floor becomes one solid beam, having the tie-rods and hoop-iron in combination with the concrete to take the tensile strain, and the concrete to take the compressive action resulting from the weight of the floor."

In the United States, the first development that suggested reinforced concrete was indicated by a patent granted to P. Summer in 1844 for metal lathing. In 1854, R. B. Stevenson received a patent for using mortar and sheet metal to form pipes. A method of reinforcing concrete for walls by imbedding horizontal and vertical timbers was patented by S. T. Fowler in 1860. A hollow cast-iron column filled with concrete was first patented by W. H. Wood in 1862.

Many patents improving upon the patents above described had been issued in France, England, and the United States during this period preceding Monier's original patent of 1867. Although it is obvious that Monier should not be considered as the originator of reinforced concrete, it is granted that he was the first to make a success of its use. Monier was far from a trained engineer but he had an inventive mind and he perceived the value of his method. With the aid of trained engineers and capital he fostered the use of reinforced concrete so that in a comparatively short time he built nearly one thousand water and gas tanks throughout France. During Monier's active period in reinforced concrete, following his original patent of 1867, he took out numerous patents covering items such as reservoirs, floors, straight and arched beams in combination with floors, etc.

It has been stated that with Thaddeus Hyatt's patent of 1878 the period of discovery for reinforced concrete ended and the new era of development began. His patent was of remarkably broad scope, covering practically the entire field of reinforced concrete and masonry construction. In support of his invention Hyatt submitted a report entitled "An Account of Some Experiments with Portland Cement Concrete Combined with Iron as a Building Material with Reference to Economy in Construction and for Security Against Fire in the Making of Roofs, Floors and Walking Surface." This paper contained a report and conclusions to a series of tests performed for Hyatt by David Kikaldy of England. In this paper Hyatt appears to be the first to state specifically that steel must be able to resist sufficient tension stress to balance the compressive stresses in the concrete.

In 1884 two firms Freitag and Heidschuch, and Martenstein and Josseaux purchased the South German rights to the Monier patents. One year later these rights together with rights in the rest of Germany and in the United States were relinquished to the engineer G. A. Wayss forming the firm Wayss and Freitag. This newly formed firm then commissioned J. Bauschinger to perform load tests in Berlin. The results of these tests were made public in 1887. At the same time Matheus Koenen deduced methods of calculations based upon the

Mr. Wasil is an assistant professor at the Illinois Institute of Technology in Chicago.

results of the above tests. This begins the first scientific approach to the design of reinforced concrete.

Meanwhile in the United States E. L. Ransom during the period 1874 to 1884 continually increased his application of metal reinforcement, first experimenting with old wire rope and then hoop iron and finally in 1884 took out a patent on the first deformed bar. Ransom's deformed bar was a spirally-twisted square iron rod.

During the early period of development many "systems" of reinforcement were advocated and used. Of the many "systems," two found wide use and one of these two, with some modifications, is used to this date. Joseph Melan of Austria used a system of structural shapes as reinforcement. Francois Hennibique of France developed a system that consisted of two series of rods; one series was straight and would lie in the lower part of the concrete; the other series would lie on the top over the supports and bend down near the center of the span and finally lie close to the straight rods. Hennibique also used flat iron stirrups in slabs and beams. His "system" also called for the pouring of slab, beams and columns as a single unit, thus being given credit for the origination of monolithic construction. His patent for this "system" was granted in 1892.

The first building of reinforced concrete goes back to 1875 when W. E. Ward constructed an all concrete dwelling at Port Chester, N. Y. The first reinforced concrete building of major proportions occurred as early as 1886 in connection with the erection of the library in Amsterdam. In 1890 Ransom built two major structures of reinforced concrete; the Academy of Sciences in San Francisco and the Leland Stanford Jr. Museum at Palo Alto, Cal. Since 1891 the development of reinforced concrete as a building material has been rapid. Some of the early buildings preceeding 1904 built by Ransom are listed below:

Pacific Coast Borax Factory, Bayonne, N. J.; St. James Episcopal Church, Brooklyn, N. Y.; Nassau County Court House and Jail, Mineola, N. Y.; Office Building, Washington, D. C.; Tank Building, Singer Manufacturing Co., Cairo, Ill.; Robert A. Van Wyck Laboratory, New York, N. Y.; College Fraternity Building, New Haven, Conn.; Residence, St. George, S. I., N. Y.; and Ingalls Building, Cincinnati, Ohio.

The use of reinforced concrete spread to other types of structures. Edward Thacher in the United States and Fritz von Emperger of Austria-Hungary made great developments in the construction of reinforced concrete bridges. Soon after 1891 an industry developed in the manufacture of concrete blocks. Burnham of Chicago introduced the use of reinforcing in foundations. Soon chimneys, grandstands, street railroads, cross ties, railroad beds, reservoirs, dams, street pavement, crib work, bins, tanks, stand pipes, piers, abutments, sewers, piles, walls, etc. were made of reinforced concrete.

The credit for early development of reinforced concrete construction in France can be given to Edmond Coignet and Francois Hennebique. Coignet ap-

(Continued on page 13)

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The Day and the Men of Creation

By J. E. Hobson

Tenth Anniversaries are traditionally a time for self-congratulatory reviews of accomplishment, for fond platitudes recalling the dear, dead days when youth was king, and for expressions of surprise at how rapidly the years have passed.

I think that none of these things is appropriate to our observance here today. 1954 is no time for our profession, or any other segment of the population to allow itself even a hint of complacency. No matter how many entries are in the record, our job has scarcely begun. As for sentiment, I will limit my indulgence to the recollection that Paul Andres, Arthur Bronwell, John Calvert and I held out first, informal discussion about organizing the National Electronics Conference here in Chicago at the Bismarck Hotel.

The years since 1944 have indeed passed with amazing swiftness, the hidden wheels of time filling them with such headlong activity that for most of us the passage of days is marked only by the appearance of graying hair —if any. But these ten years have also taken us from the ghastly pit of war, bitterly waged with every resource for destruction, to the uneasy plateau we now occupy, no more secure and little more peaceful, but with really countless possibilities for positive growth, positive development, and for constructive application of the world's resources. Our profession, which has been so greatly accelerated and benefited by the demands of war and defense has assumed a mortage that it can only begin to repay by years of diligent, constructive activity. Fortunately, it is also one of the most virile professions, possessed of the strength and potential capacity to lead the way from this unsettled plateau to at least the foothills of peace and security.

The crisis of those war years in which the NEC was born was sharply defined and was of decisive moment in the current of history. Yet the crisis of the years since the war — extending to and including this very Monday afternoon — is more challenging in almost every way and carries with it an even greater significance in man's constant struggle to find his way in a darkening world. Crisis, however stark and however dismal its prospects, has a refreshing appeal to man's curiosity and to his taste for excitement. It admits of two interpretations, contains two opposing elements of definition. On the one hand, our crisis is danger: danger whose dimensions are measured in terms of slavery, hate, disorder, suspicion, fear and destruction. However, if crisis is partly danger, it is also partly opportunity, and whereas we know the extent of the dangers that face us, the nature of our opportunities is fabulous beyond description and their scope is immeasurable.

We are at the threshold, possibly across the threshold, of another of the creative surges that have marked the great epochs in the history of man's progress. The circumstance is by no means of our contrivance alone; it springs largely from forces beyond the stars. But while a little fatalism is not out of place—indeed, it is essential—our wine is from our own vines and to think otherwise would be folly. The challenge is clear, exhilarating and direct. We have little choice but to meet it head on and we dare not fail in the opportunities it provides.

When the shadow of the atomic bomb was cast over us nearly ten years ago we joined what may be the ultimate issue of our destiny. The means for our destruction are readily at hand and a thousand common nightmares bind us together in anxiety. But the super weapons themselves are only inanimate pieces of hardware. A hydrogen bomb is no more dangerous than a cap gun—until it goes off. The explosive factor involved is really nothing more nor less than man himself. We indulge our violent passions at our peril; to contain and redirect them is fundamental to the challenge of our new age. We will meet that challenge only by the creation of a world in which all men can walk in dignity, faith and freedom, or we shall destroy civilization and possibly the earth itself by our failure.

We have entered upon a crucial political and social conflict, and there has been much earnest speculation that modern man is obsolete in spite of all his gaudy, mechanical feats, that his existing institutions are inadequate to meet the conditions of such a conflict in the atomic age. We find ourselves surrounded by gadgets, gimmicks and gizmos—and insecurity; old age insurance and schizophrenia; linear accelerators and ulcers. Our creature comforts are ingeniously catered to, but our age-old yearning for spiritual tranquility is largely unattended; our instinct to survive is more than matched by our aptitude for slaughter.

In this Age of Science our most crying need is for science of life, geared to a soul; for a morality geared to the understanding that unmoral man can destroy himself and all his works—perhaps even a part of God's universe—unless he evolves an ethic which will insure that men can live together in the face of their capacity for mutual destruction. All the problems imposed by the revolutionary strides in physical science are inherently problems in human relations. The human relations complex is essentially dynamic, not static, and the first law of this complex, then, is change, for that is the first law of dynamics. It is mani-

Mr. Hobson, director, Stanford Research Institute, Stanford, Calif., made this address at the Tenth Anniversary of the National Electronics Conference on Oct. 4, 1954.

fest that the dynamic forces confronting us today have their source in the ever-changing needs, hopes and aspirations of two and a half billion human beings. It is manifest that in order to meet these needs, to keep alive the hopes and fulfill the aspirations of these billions, with integrity and with a clear resolution that in the Age of Science we will at last prove ourselves capable of achieving them, a human revolution must occur whose course runs as deep as the current of life itself. The achievement is urgently necessary to the very survival of the so-called civilized people of this world. No longer is it sufficient for us, like zebras, to know which way our stripes run. We must be ready to change those stripes.

It is commonplace that our mechanical wizardry has far outstripped our intellectual and spiritual capacity to live in harmony together and mitigate man's historical inhumanity to others of his kind. This is precisely where you and I — engineers, technicians, scientists — have an inescapable responsibility that no amount of technical facility can avert, no digital computer can reckon. and no electronic brain can rationalize. By coincidence, by preference, by circumstances, we have chosen to cast our professional lot in areas represented here on the National Electronics Conference roster. We may be salesmen, production men, managers, teachers, writers, lawyers, contractors, researchers, or whatever, but our identification with the electronics industry is close, and if we would share its privilege we must also accept its obligation.

Foremost among these is the obligation to face the crisis of our time candidly and to bend every effort so that the opportunity will not occur soon again, probably never again. Along with men of justice and good will everywhere, we bring to the task the combined resources of our hearts, as men; our consciences, as responsible citizens of our world and of our nation; and, at last, the special mental tools of our profession. While these tools are unique, as are those of any other profession, they in no way compartmentalize or isolate us from our fellow men and our fellow citizens any more than do the poet's pen, the laborer's shovel, the industrialist's flow chart, the printer's proof or the salesman's five percent. We cannot know progress at the expense of others or to the exclusion of others. And while I am one who is frankly tempted to align electronics with destiny, it is only prudent to credit this destiny to something more than personal and professional virtue, and to acknowledge that something transcending human design has brought the components of electricity, heat and magnetism together with earth-bound crisis at this frenzied but infinitesimal point of time. If our brows become furrowed under the weight of our own importance—particularly those of us who are irretrievably mature—we should not fail to recognize that bright mornings and clear nights make this still, in truth, a lover's world. And while fitting this recognition into the over-all human relations pattern, we might well pause to examine the provocative and delightful possibility that if the remains of the Venus de Milo are ever discovered it may be found that she was wearing boxing gloves.

In our quest for knowledge and independence with which to pursue the enhancement of the human condition, the scientific and technological communities must be aware of their responsibilities and must be sensitive to the wordly and the spiritual pressures they serve and live with. Achievements in fundamental science occur because of ideas—be they intuitions or doubts, assumptions or fears—fermenting in the minds of a few men capable of addressing themselves simply and freely to the innermost secrets of nature. Names such as Euclid, Copernicus, Newton, Einstein and Rutherford come quickly to mind. Outside of the natural sciences they would be Buddha, St. Paul, Leonardo, Beethoven, Rousseau, Lincoln. Each in his own way was to inquire into and interpret the ultimate perplexities so that men might have new resources with which to bolster and replenish the intricate but often flimsy net in which we live out our lives. Each was a special genius, a creative genius.

The nature of application, and more specifically of technology, is to refine, adapt, use and experiment with new resources of knowledge for the immediate fulfillment of practical desires, to satisfy human ambitions. Out of application and technology must arise social and economic institutions that will allow men to live together in ever-increasing numbers, that will provide livelihood for millions, that will produce flourishing industries and prosperous communities, and that will provide in ever-increasing measure for man's political, economic, mental and spiritual vitality.

Application and technology place no less a demand on the will, the heart and the mind of man that do the great creative deeds and ideas. But often the gnawing irritations, the frantic haste,

the pressing drudgery, the apparently guideless misdirection, frustrate and confuse those of us who are caught up in the modern swirl, who have little time to search for meaningful objectives, little time to find satisfying substance in the tensions of daily existence. When prehistoric man fashioned his first artifact, covered his first nakedness, he sweated for his food, despaired for it. Today millions subsist on a cupful of rice and are born dead of malnutrition. Men still grasp at life on rocky wastes, live in racking poverty and degradation, while barren deserts lie fallow, weather heedlessly exhausts itself, warm ocean currents are dissipated in trackless expanse, and untold bounty lies locked in glaciers and frozen polar caps.

Crisis is the inevitable companion of the great ideas; even those ideas and ideals are not without their dangers, what is for many of us the finest definition of the human relation, the greatest creative idea of all—the idea of Christianity, has been accompanied by cruel strife, insensate bigotry and fratricidal murder, all in the name of its compassion, love and mercy. A mutation of the Christian ideal, our precious notion of the indestructible, innate dignity of the individual, is exposed to pitiless, predatory attack by the bleak, godless, humiliating philosophy of communism.

The creative, probing ideas and explorations in the natural sciences have combined to bring us to the threshold of a bright age of both material and spiritual plenty. The door across that threshold may be unlocked along with the heart of the atom and may be swung open by the force of an arm extended in creative action. The same arm can probe deep into the chemistry of man, can enable us to learn of life and death, can hold up our ideas and our guesses about this mysterious existence to the light of distant galaxies. Through the same door lie keys to the perpetual physical challenges—disease, war, famine, weather, flood and drought. Beyond the door is a world where fear, want and tyranny are unspeakably obscene.

It seems to me that the warp and woof of the challenge is inescapably in human relationships. It is beyond my belief that any but free, eager, restless men can meet these challenges, men of imagination and consummate curiosity, free to advance in give and take with the ideas of other men everywhere. A life that holds promise for peace and the rule of law, for continued growth, continued dreaming—and striving for fulfillment of those dreams, for the chance to work, to think, to build and possibly to suffer a little; that life and that promise deserve the inspired effort of us all and the roots are in freedom of thought, freedom of speech, freedom of action.

Like any other group of men, scientists among whom I include second-rate tinkerers like some of us here—even in this Age of Science, can only grope their way toward the reality of their dreams and then only if they realize that they cannot cut themselves off from the mass of humanity to go their independent way. Scientists can influence the multitude, decisively at times, but they cannot extricate themselves from it. There is a ponderous, centuries-old sum total of human achievement and human morality moving inexorably, and it is what this multitude thinks and does, not what a handful of scientists think and do, that decrees the shape of things to come, that admits or rejects the dream. The multitude is of many different races, religions, tongues, covering the whole spectrum of men's principles, ideals, emotions and shortcomings; it encompasses in its mass the wellsprings of human conduct, the secret sources of discontent, friction and strife as well as the reason and harmony of men. As it sits poised on the brink of utter chaos and final oblivion, it looks to the vanguard for a creative act of leadership. In an Age of Science the men of science have a position front and center. They must make themselves heard loud and clear.

Writer and editor John Diebold goes a step further than "Age of Science." He heralds automation as the Second Industrial Revolution. Automation is the economic, therefore the critical, heart of electronics, and to be personally associated with the beginning of the Second Industrial Revolution is very gratifying and very nice, I'm sure, for those of you active in the field. Before taking bows, however, let us reflect that the First Industrial Revolution was not an unmixed blessing. Some of its social and political misfortunes harass us still, and we have not yet resolved many of its moral conundrums. What did the First Industrial Revolution accomplish with gunpowder, for instance, whose standard killing rate is ridiculously small? Well, it managed to kill and maim millions, to inflict horror and deprivation upon millions more, and it gave bully-boys the percussive wherewithal to extract their tithes in power and blood. But what if its inventor had contemplated the new discovery long and deeply and had finally burned his formulae instead of giving it to the world. Could he have rested serene in the thought that he had done a net service for mankind? Clearly not. Gunpowder has blasted away rock and uncovered the rich coal beds that enable man to warm himself, to run factories and railroads, to convert ore into iron and steel products. Every modern implement of life that employs metal—and which does not—owes a debt to gunpowder. Before gunpowder, land was laboriously cleared, stump by stump, with hand tools. Gunpowder has enabled man to clear hundreds of times the acreage, increased his productivity a hundred fold, paved the

(Continued on page 18)

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The Annual Fall Dinner

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Featuring

John C. Sharp,

President, Hotpoint Company

Speaking on

"Tomorrow—The Engineer's Era"

John C. Sharp has been an outstanding manager and engineer in the appliance industry for 25 years. During much of this time he has been responsible for sales-minded engineering and design in the pioneering of matched appliance groups for complete electric kitchens and home laundries.

As a young man he turned to engineering because it held a certain romantic appeal. He did not follow normal academic channels. Instead, he worked as a millwright, machinist, and coal miner. Shortly after he was graduated from Ohio State University in 1923, he worked with the University of Illinois experimental station, where for three years he carried on special development work on new machinery. It is now used to coke Illinois coal.

Later he went to Mexico as a mechanical engineer. Returning to the U.S. he joined the Standard Oil Company in Chicago as a sales engineer.

In 1929 he became assistant to the chief engineer of the Chicago appliance company now known as Hotpoint. He became range engineer in 1935, and chief engineer in 1937. In 1940 he became the company's youngest vice-president.

Sharp has attracted industry attention for his research on high-frequency electronic cooking and heat pump adaptations for water heating. He has received national citations for major appliance designs.

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Double Fuselage Is Predicted

The jet-powered air transport of 1970 will incorporate a double fuselage shell at least 8 inches thick—just to reduce noise, two aircraft engineers predicted Oct. 22.

Matha M. Miller and Raymond Pollock, both of Douglas Aircraft company, Santa Monica, Calif., made the forecast at the fifth annual National Noise Abatement symposium at Armour Research Foundation of Illinois Institute of Technology, Chicago.

"Noise is becoming a major deterrent to the economical design, production, and operation of transport airoraft," the engineers said in discussing "Noise Considerations in Aircraft Structural Design."

Because the weight of an airplane in single shell construction must be increased by tremendous amounts to reduce noise, it will be more practical in the future to build a double, sound-absorbing shell, they explained.

Discussing the role of propellers and engines of conventional transports in creating objectionable noise, Miller and Pollock said the power sources are developing at a faster rate than compensatory noise reductions.

"It is obvious that we cannot permit the sound pressure inside our future aircraft to exceed sound pressures which are existent in modern airplanes.

"Improvement of present soundproofing systems to obtain the most noise reduction with the least expenditure of aircraft weight is imperative," they emphasized.

To accomplish this end, the engineers called on acoustical designers to:

—Evaluate the acoustical strength of noise sources effecting interior noise-levels.

—Study detrimental effects of flanking paths of sound into the aircraft and eliminate these paths to improve high frequency attenuation.

—Determine the potential benefits of structural strength properties in reducing low frequencies.

—Evaluate thoroughly the possibilities of double wall structures to control the most important middle frequency attenuation (decrease of noise energy) problem.

The job of the aircraft acoustics engineer has changed recently, Miller and Pollock told the symposium.

Once stereotyped in the industry as the "fiberglass man" because all he did was stuff glass blankets into spaces between fuselage frames, the acoustics engineer today has a challenging future, they said.

Miller is a member of the special subcommittee on aircraft noise for the National Advisory Council for Aeronautics and a member of the noise control committee for the Aircraft Industries association.

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The Continual Battle With Mother Nature

When the young engineer sets out in his profession one of the facts with which he is confronted is that "his work is a continual battle with Nature," junior members of the American Society of Civil Engineers were told in New York on Oct. 18 at its convention.

The speaker, Elmer K. Timby, partner in the firm of Howard, Needles, Tammen & Bergendoff, of New York, observed that Nature "did not provide transportation and other facilities where, when and as desired by the populace" but "created obstacles to such facilities." Timby added that "the job of the civil engineer is to overcome such obstacles by providing detours working facilities and living space around, through, over, under or in them on an economical basis,"

Timby went on to say:

"The young man should remember that civil engineering is a service. This is true of all professions, as with law and medicine. One difference is that the major role of civil engineering has been to provide facilities for added development and to create new buildings in which to live and work and new arteries of travel. Law and medicine devote more time to correcting than to creating.

"Civil engineering grew out of military engineering a long time ago, when wars were waged largely with brute force and awkwardness. Today diplomatic procedures, which still in most of the world are no better than before our nation was born, aided and abetted by a runaway technology are absorbing too much of the efforts of other engineers.

"It is the civil engineers who follow after the battles to restore sanitary facilities, housing, transportation and industrial plants. It cannot be said the civil engineer is isolated from the awful potential of the modern gadgets of destruction but at least he is primarily concerned with the accessories of peaceful living."

Strauss Speaks at Conference

Rear Admiral Lewis L. Strauss, USNR, Chairman of the Atomic Energy Commission, was the principal speaker, Oct. 19, at a national conference of educators, industrialists and representatives of professional societies in West Orange, N. J., where the conference was held under the joint sponsorship of the Thomas Alva Edison Foundation, the Engineering Manpower Commission of Engineers Joint Council and the Scientific Manpower Commission. The sessions were held in the former Edison home, Glenmont, in Llewellyn Park, West Orange.

Admiral Strauss' subject was "The Dependence of the Free World on the Creativity of its Engineers and Scientists" and his address keynoted a three-day discussion, Oct. 17-19, of the general topic, "Elementary and Secondary Education and the Survival, Strength, and Growth of the United States." The program marked the Fifth Thomas Alva Edison Foundation Institute.

The conference, an expression of the increasing concern of professional and scientific organizations over adequate preparation for careers in those fields, was attended by some 100 representatives of secondary education, higher education, industry, and the professional societies. More than 20 State education commissioners or their assistants participated. The general purpose of the conference, the sponsors announced, "was to emphasize the importance of elementary and secondary education in the development of future technologists, on which program the continued freedom of the Western World well may depend."

Charles F. Kettering, research consultant of General Motors Corp. and President of the Thomas Alva Edison Foundation, spoke on "Energy—Man's Slave" on Oct. 19, on which day welcome was extended by former Governor Charles Edison, son of Thomas A. Edison and honorary president of the Thomas Alva Edison Foundation.

The first day, Oct. 17, was of a get-together nature. On Oct. 18, speakers included Dr. Thomas Chilton, technical director of the Development Division of the Engineering Department of E. I. du Pont de Nemours, and chairman of the Engineering Manpower Commission of Engineers Joint Council; Vice Admiral Harold G. Bowen, U.S. Navy (ret.), executive director, Thomas Alva Edison Foundation; Dr. M. H. Trytten, director, Office of Scientific Personnel, National Academy of Sciences (also connection with National Research Council); Dr. Howard A. Meyerhoff, executive director, Scientific Manpower Commission; Dr. Fletcher G. Watson, James Bryant Conant lecturer, Harvard Graduate School of Education; Dr. A. W. Davison, consultant, Owens-Corning Fiberglas Corporation; and Dr. Rolland J. Gladieux, assistant principal and head of the science department of Kenmore Senior High School, Kenmore, New York.

Discussion groups were to develop a statement of policy, national in scope, and a list of specific recommendations concerning means by which industry, education and the professional societies can work closely together in carrying out the goals of the conference.

In detailing the purposes of the Fifth Thomas Alva Edison Foundation Institute, the announcement stated that it is intended to:

"1. Recognize that the elementary and secondary school science and mathematics teachers are in a pivotal position, with respect to the survival, strength and growth of the United States;

"2. Develop a public, teacher and student acceptance of an elementary and secondary curriculum that gives engineering and science an emphasis commensurate with their importance to a constantly expanding, competitive industrial economy;

"3 Encourage qualified students to consider careers, including teaching, in science and engineering and to develop their individual capacities for originality and leadership in their specialities, as well as in the affairs of industry, education and government, and

"4. Take the necessary steps to insure an understanding, by all students of our industrial economy, of the historical position of technology in this economy, and its international impact."

The luncheon and final afternoon, at which the address by Admiral Strauss, Dr. Kettering and former Governor Edison, were made, were a phase of Light's Diamond Jubilee, commemorating the 75th anniversary of the invention of the incandescent light by Thomas A. Edison.

New Oil Is Found For Steel Rolling

An economical domestic substitute for palm oil as a lubricant in the cold rolling of steel has been found by scientists at Armour Research Foundation of Illinois Institute of Technology, Chicago.

Recent investigations conducted at the Foundation revealed that a substitute based on animal fat materials proved to be both adequate and economical, according to John P. Sheehan, supervisor of mechanical metallurgy in the metals research department of the Foundation.

"Tallows, readily available from meat packing concerns in sufficient quantities, can be processed into a lubricant which can be used by the steel industry in its color rolling operation," Sheehan said.

The search for a substitute for palm oil was conducted at Armour Research Foundation under sponsorship of the American Iron and Steel Institute.

Results of the research were reported recently by Sheehan in a paper presented at the Birmingham (Ala.) regional technical meeting of the AISI. The paper was co-authored by Sheehan, Harry Schwartzbart, ARF research metallurgist, and W. R. Johnson, formerly of the Foundation.

"The steel industry became concerned over the curtailment of palm oil supplies during World War II because of submarine menace to shipping lanes."

"Palm oil, an abstract from palm nuts, must be imported from Africa and the West Indies," he explained. "It was feared that in another emergency, the supply of palm oil might be cut off entirely."

The substitute developed at Armour Research Foundation will provide the steel industry with a product that is domestic, economical, and available in sufficient quantities, it was pointed out.

This research was preceded by a similar project at the Foundation, dealing with hot dip tinning, which led to the development of a tinning oil compounded from high grade beef tallow in 1951.

Titanium Alloy Is Replacement for Steel

A light-weight titanium alloy considered suitable as a replacement for steel in military weapons has been developed for Ordnance corps by Armour Research Foundation of Illinois Institute of Technology, Chicago.

Use of the alloy in the manufacture of heavy weapons and tanks would greatly increase their mobility, according to Dr. Donald J. McPherson, nonferrous metallurgy supervisor at the Foundation.

The alloy was developed during the course of a program being sponsored at the Foundation by the Watertown Arsenal laboratory, Watertown, Mass. The laboratory administers much titanium research for the Army.

Dr. McPherson explained that plates of the new alloy fabricated by ARF engineers were heat-treated and tested at Watertown and found to be "very promising."

Col. B. S. Mesick, commanding officer of the arsenal and coordinator of the Army titanium program, revealed that the titanium alloy is 40 per cent lighter in weight than high-strength steel.

The Watertown tests also show that the alloy is highly corrosion-resistant and has properties which compare favorably with those of steel used in manufacturing weapons.

Ordnance stressed that further tests must be made to assure that the alloy is as good as first tests indicate. But the alloy is considered by Ordnance as a potential substitute for steel in many ordnance components.

Another property determined by the Watertown tests is that the alloy shows tensile strengths up to 192,000 pounds per square inch. This is approximately 42,000 pounds per square inch stronger than any commercial alloy of titanium now being produced.

Armour Research Foundation, which has been conducting titanium research for five years, is continuing its work in the program which resulted in the new alloy, Dr. McPherson reported.

He said research is producing promising results with similar titanium alloys aimed at early use in aircraft engines and structural components.

Noise Abatement Meet Is Ended

Noise and how to combat it held the spotlight at the National Noise Abatement symposium Oct. 21-22 at Armour Research Foundation of Illinois Institute of Technology, Chicago.

The symposium, held for the fifth consecutive year, was aimed at making engineers and industrial leaders more conscious of what can be done to reduce noise.

It was the first symposium devoted specifically to reduction of noise in machinery, according to Stannard M. Potter, symposium chairman and acoustics engineer at Armour Research Foundation.

The first session, on factory noise, included an address on "Gear Noise Reduction," by Dr. Kurt G. F. Moeller, of the Acoustics and Vibration laboratory, Naval Engineering Experiment station, Annapolis, Md.; "Pneumatic Tool Noise Reduction," by Walter C. Chaffee, Keller Tool company, Grand Haven, Mich., and "Machinery Quieting," by John Engstrom, International Business Machines corporation, Endicott, N .Y.

"Merchandising Quiet Products" was the subject of a luncheon address by Richard S. Burke, Sears Roebuck and company, Chicago.

The Oct. 21 afternoon session featured "Noise Control of Appliances," by G. Norman Sawyer, General Engineering laboratory of the General Electric company, Schenectady, N. Y.; "Noise Control of Outboard Motors," by Warren C. Conover, Johnson Outboard Motor division of the Outboard Marine corporation, Waukegan, Ill., and "Air Conditioner Quieting," by Dr. Carlyle M. Ashley, Carrier corporation, Syracuse, N. Y.

Vehicle noise was discussed on the second day of the symposium, Oct. 22, with addresses on "Quieter Automotive Vehicles," by David C. Apps, General Motors Proving Grounds, Milford, Mich.; "Less Noise from Jet Engines," by John Tyler, Pratt and Whitney Aircraft division of the United Aircraft corporation, East Hartford, Conn., and Noise Considerations in Aircraft Structural Design," by Matha M. Miller and Raymond Pollock, both of Douglas Aircraft company, Santa Monica, Calif.

Carl Christenson, United Air Lines corporation, Denver, spoke on "Noise on the Airlines" at the Friday luncheon session.

A roundtable panel, moderated by Dr. Jerome R. Cox, Jr., Liberty Mutual Insurance company, Boston, discussed medical and engineering noise controls in connection with hearing loss.

A tour of the acoustical facilities at Armour Research Foundation and the Parmly Foundation for Auditory Research concluded the symposium, which was held in Illinois Tech's Chemistry Building, 33rd street and Dearborn avenue.

The National Noise Abatement Symposium is sponsored jointly at Armour Research Foundation, the Acoustical Society of America, Council on Industrial Health of the American Medical Association, American Society of Safety Engineers, National Noise Abatement council, American Society of Planning Officials, American Industrial Hygiene association, and the Acoustical Materials association.

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Any member of the Society may compete regardless of grade of membership.

Papers shall not be highly technical in nature. A clear, concise and interesting coverage is desired rather than complex formulae or derivations. The subject discussed should be of general interest to engineers but should not be of a political or highly controversial nature.

All members of the Society who wish to submit papers in this contest should contact the Secretary as early as possible and not later than February 1, 1955, and request a copy of the rules governing the competition and an outline of the minimum requirements for acceptance of papers. These cover in detail the mechanical make-up which should be followed in preparing and submitting papers for the contest.

Papers must be submitted to the Secretary for acceptance by April 1, 1955. If the Secretary finds that they meet the minimum requirements of the contest, he will forward them to the Awards Committee for review. The papers will be identified by number only. The Secretary of the Society is the only person who will maintain the key to the authors.

If any paper does not comply with such minimum requirements, the Secretary will so advise the author and discuss with him the points which are below the minimum requirements. The papers which are accepted will be forwarded to the Awards Committee for judging not later than May 1, 1955. Papers which have not met the minimum requirements by that time cannot be considered for prizes.

Papers which are accepted will be judged on originality of presentation, editorial merit and value to the engineering profession.

The papers submitted must not have been previously published in substantially the same form. No copyrighted materials shall be used unless permission has been obtained and so indicated. All manuscripts, drawings, etc., are to become the property of the Society and cannot be published without the consent of the Society.

If the papers submitted are NOT of sufficient merit to warrant the award of any or all of the prizes, the Awards Committee reserves the right to award less than the five established prizes or to postpone the competition.

The winners will be announced and the prizes presented at the annual meeting of the Society in June, 1955.

WSE Executive Secretary will furnish you with a complete set of rules and minimum requirements on request.

Reinforced Concrete

(Continued from page 6)

plied well known principles of mechanics to evolve a system of design for reinforced concrete while Hennebique based his calculations upon results obtained in practice. Together, Coignet, the scientific investigator and Hennebique, the commercial organizer, are regarded as the pioneers of the modern evolution in the art of building. During the period of 1892 to 1899, Hennebique's work in reinforced concrete resulted in the completion of some three thousand structures, either by himself of by contractors licensed to work his "system."

The flat slab system of construction developed as a natural consequence in the growth of reinforced concrete, for here, reinforced concrete is used as no other material can be used. The advantage of monolithic pourings and reinforcing in all directions gives the flat slab a uniqueness such that it takes advantage of most of the properties that distinguish concrete from other materials.

O. W. Norcross, who apparently was the pioneer in this field, made some rather crude attempts to build floors without the use of girders and a patent was issued to him in 1902. The patent ". . . relates to a flooring for buildings which has been designed with a view of securing the advantages, first, of entirely dispensing with all girders or floor beams, which have heretofore been regarded as absolutely necessary for supporting the floors of buildings; second, to provide a form of floating which will utilize to best advantage the immense crushing strength of concrete, and third to provide a strong inexpensive solid inflexible flooring which can be laid in place by unskilled labor."

". . . the metallic network of my flooring is formed by strips of suitable wire-netting. In practice I have used a hog wire fencing, which is a fencing of the same class as ordinary poultry wire fencing, except that the same is made of considerably heavier wire."

". . . in laying a flooring constructed according to my present invention the posts are first erected and a temporary staging is built up level with the tops of the posts. Strips of the wire-netting are then laid loosely in place on top of the staging. In practice I have laid this wire-netting in straight lines from post to post and also crossing diagonally from post to post."

However, C. A. P. Turner developed the flat slab system into a construction method that with some modifications is followed to this day. We first hear from C. A. P. Turner in a letter published by the "Engineering News" of October 12, 1905, where he first describes his "Mushroom System." ". . . the idea being to avoid the expensive forms for beams, to secure a neat and unbroken ceiling line, together with a considerable economy of material without sacrificing strength."

The term "mushroom" originated by Turner as applied to flat plate construction was used because of the fancied resemblance to the mushroom of the column capital and the radial reinforcing bars around the column. It was also editorially suggested by Turner that the rapidity of this type of construction can be compared to the over-night growth of the mushroom.

In the October 4, 1906 issue of the "Engineering News" Turner describes his first "Mushroom System" building; the C. A. Bovey Building in Minneapolis, Minn. Since this was a radical innovation in building construction the Minneapolis Building Department only allowed its construction after the owners agreed that a load test must be performed before the building could be put to use. A panel was loaded with 700 lbs. per sq. ft. The allowable deflection required by the building department was $\frac{5}{8}$ inch. Tests showed a scant $\frac{1}{4}$ inch deflection on a slab about $7\frac{1}{2}$ inches thick for 16 ft. by 18 ft. spans.

After Turner's success with this building he immediately contracted to build a 130′ x 140′ building in Milwaukee and a 7-story 235′ x 165′ building in St. Paul. Turner's bid on the St. Paul building was $10,000 less than timber construction and $30,000 to $40,000 less than other reinforced concrete construction. In the short period from the initial "mushroom system" building of Turners to 1914, Turner or engineers licensed to use the "mushroom system" designed some one thousand buildings located mostly in the middle and south west. In 1911 a patent was granted to C. A. P. Turner.

Meanwhile the Leonard Construction Co. bought out the Norcross patents and instigated a suit against Turner for infringement of patents. Turner in turn sued Leonard Construction Co. in a counter claim. Thereupon a heated court battle ensued. Finally on December 10, 1914 the United States Circuit Court of Appeals, Eighth Circuit, decreed in favor of the Norcross patents. Thus, from 1914 to 1919, when the Norcross patent expired, all flat slab construction was licensed under the Norcross patent. Of course, since 1919 the flat slab has been in the public domain.

Reinforced Concrete Design.

In the early stages of reinforced concrete development, its builders had no recognized procedure of design. Monier, Hennebique, and Ransom erected their works solely from practical instinct and experience. Practice in reinforced concrete was far ahead of theory. When G. A. Wayss bought out the German and American rights to the Monier patents in 1884 he recognized the necessity for tests and analytical interpretations of such tests for reinforced concrete. Thus, Wayss commissioned J. Bauschingen to

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perform load tests and Mathias Koenen, a Government Architect in Berlin, to deduce methods of computations from the load tests. Koenen first published his design methods in the "Zentralblätter der Bauverwaltung" for 1886. They were again published together with the results of Bauschinger's tests in 1887 in a brochure entitled "Das System Monier, Eisengerippe mit Zememtumhullung".

It is interesting to note that although Koenen's was the first comprehensive theory of reinforced concrete published and that many publications followed based on different assumptions, Koenen's procedure was almost universally accepted and in all major respects it is used until this day. Koenen based his theory of flexure for reinforced concrete on the premises that 1) plane sections that are perpendicular to the neutral axis before bending remain plane and perpendicular to the neutral axis after bending, 2) stress is proportional to strain, 3) perfect bond exists between steel and concrete, and 4) tension stresses in the concrete are not considered. Early controversy over the theory of reinforced concrete was based on the fourth assumption. Some investigators considered the tensile strength of concrete as a factor in design and later some investigators recommended the reconsideration of the use of Hooke's Law (assumption 12) for reinforced concrete.

The procedure of design for reinforced concrete was crystallized by the publication of the Leitsätze (Preliminary Recommendations) for the design, construction and testing of reinforced concrete structures by the Vergand Architeken—und Ingeniern Vereine and the Deutsche Beton Verein in the year 1904. This was the first, of the many to follow, building code recommendations for reinforced concrete. The "Leitsätze" used Koenen's design procedure. This was followed shortly by the "Regulations" of the Prussian Government in 1904 and 1907, "rules" of the French Government in 1907, "recommendations" of the British Reinforced Concrete Committee in 1907 and 1911, "rules" of the Austrian Ministry of the Interior in 1908 and 1911 and the "recommendations" of the Swiss Society of Engineers and Architects in 1909.

In the United States in the years 1903 and 1904 the American Society of Civil Engineers, the American Society for Testing Materials, the American Railway Engineering and Maintenance of Way Association and the Association of American Portland Cement Manufacturers appointed special committees to act as a joint committee for the purpose of ". . . investigating current practice and providing definite information concerning the properties of concrete and reinforced concrete and to recommend necessary factors and formulas required in the design of structures in which these materials are used." This committee became known as the Joint Committee on Concrete and Reinforced Concrete. In 1908 the Joint Committee began the preparation of the Progress Report which was published in the Transactions of the American Society of Civil Engineers in 1914. The final report of the Joint Committee, now known as the First Joint Committee, was completed in 1916 and published in the Transactions of the American Society of Civil Engineers in 1917.

Much influence upon the development of reinforced concrete in the United States can be attributed to the American Concrete Institute. This organization was initially chartered in December 1906 as the National Association of Cement Users. It changed its name to the American Concrete Institute in July of 1913. Since its inception, the American Concrete Institute has published in its Journal the many original articles written by individuals or the organization's many committees, relating to most of the advances made in reinforced concrete and concrete technology during this period in this country.

By the time of the final report of the First Joint Committee, the American Concrete Institute became an affiliate. Also the names of two of the other affiliates were changed to the American Railroad Engineering Association and the Portland Cement Association.

The Joint Committee was reorganized on two additional occasions to submit recommendations for reinforced concrete. In 1924 the Second Joint Committee submitted its report and in 1940 the Third Joint Committee submitted its report. The Third Joint Committee included the American Institute of Architects.

Since the early 1920's the American Concrete Institute through one of its committees has been adopting codes of recommended practice for reinforced concrete. For the most part the Joint Committee codes and the A.C.I. codes are very similar. However, due to the continual organization of the A.C.I. committee more frequent revisions are made in their codes, recognizing the many and continual advances made in reinforced concrete design theory and practice. The last Joint Committee code was adopted in 1940, but since then the A.C.I. code was revised in 1941, 1947, and 1951.

Since Bauschinger's first load tests in the years following 1884 many tests have been performed to verify, modify or discover theory and to establish the constants that are needed. Outstanding research men in this field are C. Von Bach for his work on compressive tests, A. Considere for his work on beams and columns, A. N. Talbot for his work on beams, columns and footings and

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especially his work on field load tests of a flat slab building, M. O. Withey for tests on beams and columns, D. A. Abrams for his work on concrete mix design and bond, W. A. Slater for his work in practically all phases of reinforced concrete but in particular for his work on flexural strength of concrete and on the two way and flat slab, T. D. Mylrea for his work on bond action of hooks, F. E. Richart for his great work on plasticity in columns, A. P. Clark for his work on bond and in particular as it concerns the high bond bar, and many other investigators.

Much credit must be given to the research analysts that have developed the present art of reinforced concrete design and theory. Following Koenen, subsequent theories had been advanced by de Mazas, Neuman, Melan, Coignet, Considere, de Tedesco, von Thullie, Ostenfeld, Sanders, Spitzer, Lutken, Ritter, Hatt, Talbot, Turneaure, and others. Following the present crystalization of design methods, the noteworthy advances in analysis can be attributed to H. M. Westergaard for his work on plate theory, C. S. Whitney for his work on arch theory and plastic theory, and H. Cross for his great contribution to frame analysis.

The educators that have compiled the works of others into textbooks that have been widely used should be mentioned in this history. Of the many textbooks, the very first deserves special attention. "Der Eisenbetonbau" (Concrete-Steel Construction) by Emil Morsch gained the author the title of "father of reinforced concrete" in Germany. Other authors are Taylor, Thompson, Sutherland, Turneaure, Maurer, Peabody, and others.

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CRERAR LIBRARY
News and Notes

Attention was called in this column in October to the program, "A Day at Crerar Library," which was one of the activities arranged for the National Metal Exposition and Congress held in Chicago November 1-5. Several exhibits were prepared for the occasion which will be continued through November. Early classics in metallurgy are on display in the WSE lobby, as one of these exhibits. In the main lobby of the library building are three other exhibits of general interest to engineers. One of these describes the activities involved in preparing and publishing CRERAR METALS ABSTRACTS. Another demonstrates the copying services available through Crerar's Photoduplication Service. And a third represents the collections of the Library under the caption: Metals Literature of the World in Crerar Library.

A Guide to Metals Literature in The John Crerar Library, was published for distribution during the National Metal Exposition and Congress. Its authors, Messrs. Ellis Mount and Ammiel Prochovnick are research associates on the staff of Crerar's Research Information Service. The *Guide* is an important supplement to another publication by Mr. Mount, issued in 1953: *Abstracting and Indexing Sources for Literature on Metals and Metal Fabrication* (Crerar Bibliography Series No. 2).

* * *

A very important gift was received in October as an addition to the collection on heart research. Mrs. James B. Herrick gave to Crerar the private library of her husband, the late James B. Herrick, eminent Chicago physician. Herrick's writings, including his classic paper on "Clinical Features of Sudden Obstructions of the Coronary Arteries" (1912), are rich in references to early writers in the field of heart research. His private library, while not large (approximately five hundred titles), was a good cross-section of the important writers in this field from the seventeenth to the mid-twentieth centuries. This gift from his wife adds substantially to Crerar's already strong collections on the heart and its diseases.

* * *

November 23 marks the sixtieth anniversary of the first meeting of the Directors of The John Crerar Library. They met in the residence of Mr. Marshall Field, one of the first directors. At that meeting, the executors of John Crerar's will informed the directors that they could now proceed with organization of the Library. Thus the stage was finally set for the formal organization of the Library in 1895.

* * *

Crerar Current, the Library's news bulletin, was established in February 1954, as a quarterly publication. An extra issue was printed for October, with which the bulletin becomes a monthly.

Convert Recording Heads to Playback

Changing many commercial magnetic recording heads to function as modulator playback heads is now possible by a simple operation developed recently at Armour Research Foundation, Chicago.

The modified head provides a constant level output regardless of tape velocity since the head is sensitive to the magnetic field of the tape, according to John P. Skinner, magnetic recording manager at the Foundation.

This is useful for time-scale changing and for control of processes and machines during accelerations and intermittent starts and stops of the record, he explained.

The commercially available heads are adapted by drilling suitable openings in the core and adding simple excitation windings.

The adapted head is not meant to replace original magnetic recording heads in all cases, Skinner warned. But for non-critical applications not requiring an excellent signal to noise ratio, such as in digital computers, the method is expected to be valuable.

Research that resulted in the $80 million annual magnetic recording industry was pioneered by Armour Research Foundation which owns or controls in excess of 250 patents registered in many countries.

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Men of Creation

(Continued from page 7)

way for agricultural revolution as surely as will the radioactive tracer and the captive sunbeam.

This is patently a distortion, so for another aspect of the Industrial Revolution's significance let us delve even further back, to a time soon after man first chipped flint for tools, a creative act, and for weapons, an act of survival. A symbol of progress in this context would be the wheel—one of the supreme creations. But a wheel at the time of the pyramids turned no faster and no slower than it did at the time of George Washington. It waited for thousands of years upon the pleasure of James Watt and his teakettle, and then the wheel became the wheel of the cotton gin and the railroad, the wheel of industry, agriculture and transport, re-forming the face of the earth and the life of its inhabitants. It was a package deal, however, and we got fabulous war machines, death on the highways and the neurotic clatter of urban life in the packaged bargain.

Naturally, I am aware that this is a cantankerous, limited and perhaps laughable account of the evils of gunpowder and wheels in comparison with their true significance to man's progress. Nevertheless, in the light of that history what are we to do with guided missiles when all it takes is one madman at the control panel to send a supersonic devil carrying instantaneous ruin across the world? In a different connection, what are we to do with television when it is turned to the ends of demagoguery by a new Dr. Goebbels; or with facsimile when it spreads the poisonous distortions of Pravda? When progress is measured by man's ability to construct rockets so that he may conquer the moon in order to use it as a launching platform for rocket attacks on himself, progress becomes a monstrous liability. If we would preserve freedom, we must first preserve life.

Untiring, cold, massive, Univac is but a senseless jungle of circuits, keys and contacts. It is a humorless, heartless creature of speed and efficiency which we assume to be virtuous. But whatever else it may be, it cannot become a hallmark of a positive, creative Age of Science until every last individual associated with its manufacture, maintenance, operation and use has freed himself of malice and has forgotten prejudice.

Although these examples out of the past and present are obvious oversimplifications, they do represent some of the imponderables with which we must wrestle. So far man has not done spectacularly well. He has survived, of course, but possibly only because his generals lacked an atomic arsenal. Cause and effect, action and reaction, intermingle in a confusing fashion back through the cloudy distances of history. To find guideposts to the roots of their meaning, to the roots of our crisis and our opportunity, to find a lesson in the supreme, primary act of positive creation, we must go back beyond Einstein, back beyond George Washington and James Watt, beyond the pyramids, beyond the wheel, man and the earth itself.

"In the beginning," we are reminded in the Book of Genesis, "God created the heaven and the earth. And the earth was without form and void." The Spirit of God "moved upon the face of the waters. And God said Let there be light." So before the end of the very First day there was energy, matter and water. For all our vain conceits we still know blessed little about energy and matter, the water of the world's streams trickles away unused and the water of the ocean surges untended. By the end of the Second day there was land; only recently has man learned not to ravage the land, learned to nurture its fertility and count up its treasures. On the Third day the earth brought forth grass and the fruit tree was yielding fruit "after his kind, whose seed is in itself"; grass with its chemical photosynthesis laboratory remains a baffling mystery. Reproduction continues as a confounding riddle, though it proceeds pleasantly enough to be sure. By the end of the Fourth day there was the sun, with its heat and light, its inexhaustible supply of cosmic energy; only in 1954 is there beginning to be a concerted effort consciously to draw these energies to man's control and benefit. Finally, by the Seventh Day, there was man, man who was charged "to be fruitful and multiply and replenish the earth and subdue it: and have dominion . . . over every living thing that moveth upon the earth."

Man frequently seems to be a pretentious, arrogant bundle of vanity with uncertain and tenuous dominion over very little—least of all his own destiny, his own peace of mind. He would have spun back into the void long before this had it not been for prodigious, creative stirrings in the souls of a few men of everlasting genius. But man can be fruitful, he can replenish the earth, he can be secure in his dominion if he will follow these men of genius, if he will devote his energy, his conscience, his substance and his faith to technology, politics, commerce and all the other operational arts of a complex civilization; if, specifically, his men of science, electronics engineers among them, will put their dynamic scientific methods and their formidable skills to the challenge of human relations. A proper turning now, at this moment of precarious balance between terror and hope, could mark the beginning of a vast upward surge in human history, infusing life with enriched purpose and meaning.

One of the colossal geniuses, a sculp-

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tor, painter, engineer, poet, architect, a young Italian, spent four years on the catwalks and platforms of a flimsy scaffolding performing one of the superb creative acts of all time. Across the vaulted ceiling and lunettes of the Vatican's Sistine Chapel in Rome, Michelangelo spread the story of the Creation itself, giving form, color and inspired majesty to the Genesis, the Temptation and the Deluge, giving voice to the sublime harmony of God's universe in language that speaks with matchless grandeur for the destiny of men. The divine, flaring fire of creativity burns through these awesome frescoes with a sublime intensity and revealing inspiration that defies our most florid descriptions.

Just as Michelangelo turned to the Genesis for his symbols, so can we turn to the elements of creation for a basic transformation in the physical world: to the exposed helium atom, the energy of the sun, the hydrogen energies of the sea, the fallor chemical riches of the earth's crust. The tools of our trade—mass communications, automatic controls, lightning calculators, supersonic speeds, servo-mechanisms, will take a leading role in the transformation. If we are to have a new Day of Creation—and I think we must, those in the forefront of science and technology must be prepared to be the Men of Creation.

Implicit in the new Day of Creation, in the opportunity of our crises and in the challenge to men's spirit, is a luminous sense of human dignity and nobility; implicit in the idea of the Age of Science is both material and spiritual abundance, and inherent in scientific and technological achievement should be the vital spark of creation that will enable men to endure.

In his poem "Andrea de Sarto," Robert Browning neatly sets the charge and the challenge: "Ah, but man's reach should exceed his grasp, or what's a Heaven for?"

Deep Conversation

First engineering student: "Hi! What did you do last summer?"

Second engineering student: "I worked in Des Moines."

First engineering student: "That so? Iron or coal?"

Economic Factors Affect Pipe Lines

The approach of the delivered price of natural gas to that of coal and oil, competitive fuels, has compelled natural gas pipe line companies to give certain economic factors top consideration heretofore not given them, in designing transmission facilities, William B. Poor, of the New York engineering firm of Ford, Bacon & Davis, told the convention of the American Society of Civil Engineers on Oct. 21 in New York. Forthcoming code revision for pressure piping was another factor listed.

"The economics of natural gas transmission are, each year, becoming more competitive, not as between pipe line companies particularly, but primarily as the delivered price of gas approaches, or equals, the price of competitive fuels —coal and oil," said Poor. He said that this situation was brought about by "the escalation of the field price of gas, increased steel prices, increased costs of rights-of-way, more stringent control by State authorities" and other circumstances. Poor went on:

"To maintain a competitive position in the fuels market, the pipe line companies now are faced with the ever-increasing responsibility of designing their transmission facilities with due regard to economic factors not heretofore given prime consideration.

"Basically, the economic factors affecting engineering design appear to be the character of the market to be served and development of the load factor; availability and economics of gas storage fields; economic determination of line size versus ultimate installed horsepower, and careful predetermination of the pipe line location."

Poor's paper said further:

"Since the cost of owning and operating a natural gas pipe line system is nearly a constant, whether all or only a part of its capacity is utilized, the cost of transporting gas on a unit volume basis is almost inversely proportional to the load factor. It has been shown that large volumes of interruptible industrial sales, up to 60 per cent of the annual sales required for 100 per cent load factor, may be impossible. The gas industry has, therefore, in an effort to obtain high load factor operation without interruptible sales, developed various schemes of storage facilities located at or near the market areas.

"Only underground storage is sufficiently low in cost to permit economic terminal storage in sufficient quantities to level annual load variations. Only the storage in depleted natural gas reservoirs and, to a limited extent, in water bearing sands, has been used to date to store such large volumes. The cavern storage method through mining operations offers promise where natural reservoirs are not available.

"Today there are in operation storage fields having a combined capacity of 1,200 billion cubic feet and economically serving markets as remote as 300 or more miles. Where such storage fields are available, gas may be delivered into storage during Summer months rather than being sold as cheap interruptible fuel. Such a program enables the pipe line to operate at a high load factor and preserves deliverability to meet peak Winter demands of space heating customers, thereby providing the maximum utilization as a superior fuel."

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Sargent & Lundy Designs for A.E.C.

Argonne National Laboratory, operated for the United States Atomic Energy Commission by the University of Chicago, announced on Oct. 7 that Sargent & Lundy, Chicago, has been selected as the architect-engineer for the design of the Experimental Boiling Water Reactor which has been authorized as part of the Commission's five-year program for development of competitive electrical power from nuclear fuel. Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, has been chosen to design, develop, construct, and install the power generation, heat transfer, and special equipment for the power cycle.

The Experimental Boiling Water Reactor (EBWR) which will built on the Argonne site in DuPage County, Illinois, will produce 20,000 kilowatts of heat and 5,000 kilowatts of electricity. The reactor will use slightly enriched uranium fuel and will be moderated and cooled by ordinary water. Plans call for construction to start during the coming year with completion scheduled for 1956.

Development and construction of the reactor follows promising investigations conducted by the Argonne research staff during the past two years during which a small temporary reactor converted water into steam directly without the use of an intermediate heat exchanger. These studies, as well as many other investigations conducted by Argonne, are aimed at producing electrical power from nuclear fuel so that this new fuel can be used economically to supplement conventional fuels in meeting the nation's demand for energy.

A boiling-water reactor has the following advantages over the more conventional circulating-water reactor: the steam generator normally required for pressurized water reactors is eliminated; pumps can be much smaller and less expensive because the only pump requirement in the primary circuit is that of returning water from the condenser to the reactor vessel; the reactor will be operated at a lower pressure and lower maximum temperature than pressurized water reactor systems, thereby simplifying fuel and structural materials problems.

The Laboratory will coordinate the work of the project for the Atomic Energy Commission and will design and construct the reactor core and the reactor control mechanism.

Allis-Chalmers, under its contract, will develop components of a power system provided with special sealing devices which will make the components tight against leakage of steam, air, or water. The development of power plant components from which leakage of primary steam and water is held to virtually zero is desirable from an operating standpoint. In addition, such a development will make possible the use of heavy water instead of light water in the boiling water system. Heavy water possesses important nuclear advantages but is expensive. The cost of power from nuclear plants might be reduced significantly by using heavy water if techniques for eliminating leakage of the heavy water can be perfected.

The Experimental Boiling Water Reactor is to be a small scale pilot plant and the electricity produced will not be competitive with power from large central-station plants. The information gained from its construction and operation is expected to contribute significantly toward the goal of commercial nuclear power.

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U.S. Chamber Issues Employment Booklet

Ways for businessmen to provide steadier employment are outlined in a pamphlet just issued by the Chamber of Commerce of the United States.

A strong demand for job stabilization has been created by the concern of businessmen with the importance of regular employment to the employee and his family and to the community, the Chamber reported.

But development of methods for use by the individual businessman has been slowed up by the preoccupation of experts with such issues as mass unemployment and the guaranteed wage, the Chamber said.

The pamphlet, "Steadier Jobs," concedes that, in some instances, irregular employment and production are made inevitable by such factors as style changes, harvests, fickle demand and the impracticability of storage.

But it continues:

"There are, however, a number of sales production and personnel policies which companies in every line of business, whether retail, wholesale, service or manufacturing, have found helpful in reducing irregular employment."

The success of these policies is dependent in large part on "systematic and continuing attention from top executives," the booklet adds.

One of the pamphlet's features is questionnaires which will help the employer assess his firm's job stabilization policy and suggest ways of improving the policy. The pamphlet includes steps for the establishment of a steadier jobs program.

The booklet points out that job stabilization can help businessmen cut costs. It cites reductions in unemployment taxes which may total as much as $30 to $40 per $1000 of payroll.

The pamphlet may be obtained from the Economic Research Department, Chamber of Commerce of the United States, Washington 6, D. C. Single copies are 25 cents and quantity prices are available.

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OVER THE MANAGER'S DESK

November gives us three different phases of life. The first is election where an American has the opportunity to select a candidate for specific offices. The second is Armistice Day, where we honor those who have served us in the past. The Third is Thanksgiving, where we sit back and count our blessings.

Are you as an employer or as an employee in a position where you can count your blessings as far as your engineering accomplishments are concerned; are you in a position where you are honoring the past instead of the present and the future; or are you ready to select a specific candidate or job to do better engineering? If you have any doubt at all, better contact our office for THAT engineer you need or the particular job you want to better yourself.

B.H.A.

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On Training —
Letters from Leaders

In the last issue of Midwest Engineer we published another of about thirty letters received from leaders of Chicago-area firms concerning shortcomings noted in the engineers in their employ. Many of the letters also suggested what the engineers should do to correct their deficiencies.

Significantly, the engineer's technical training is generally considered adequate. In the broad area of Human Relations, however, engineers seem often to be "under achievers," according to the viewpoint of the industrial leaders as reflected in their letters.

Here, then, is the next letter:

Dear Mr. Becker:

I was interested in your letter of August 31 telling of the interest which the Western Society of Engineers proposes to take in engineering educational matters. Many volumes have been, and could be written on this subject, and I take this opportunity to emphasize one phase which, it seems to me, is becoming of increasing importance.

During the many years in which I have been interviewing young college graduates who either seek or are considering a position in our engineering organization, there has been a definite change in their attitude and approach to a professional position which, in my judgment, is decidedly for the worse. Going back thirty or forty years, most engineers had never heard of a 40 hour week, pay for overtime, pension plans, insurance plans, 5 day week, and other similar items which have been brought into focus in recent years by labor unions throughout the land.

In interviews I have had with young graduates this last summer a majority of them raised questions on these points. In a discussion with other members of the Committee on Engineering Education of the American Society of Engineers, all of whom are educators, they agreed that a good deal of this attitude was brought on by the employers themselves. The shortage of engineers seems to have brought about a situation where would-be employers of young engineering talent send representatives to the various campuses all over the country, as much as six to eight months ahead of date of graduation. My educator friends tell me that these employers vie with each other in painting the most attractive picture possible, giving emphasis to the short work-week, bonus pay for overtime, vacation and sick allowances, insurance, pensions, etc. It seems possible, or even probable that a good deal of the present mental attitude is encouraged and even developed by the engineering employers themselves. My opinion is that a redevelopment of professional consciousness on the part of the young engineer is the most urgent need today.

You may be interested in the report of the Committee on Engineering Education of the ASCE which will be submitted to the Society in October.

I am enclosing herewith a copy for your information and file with the idea that it will not be used in any way for publicity here in Chicago.

With best wishes, I am

Cordially yours,

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Armour Research Helps Develop Gun

A lightweight recoilless rifle and new-type ammunition with unprecedented tank-killing power were unveiled to the public Oct. 12 by the Army Ordnance Corps in Lacarne, Ohio.

The weapon, a 106 mm battalion anti-tank rifle known as "the BAT," has double the penetrating power of any existing recoilless rifle. Weighing less than 500 pounds, it can be carried by three men or mounted in a Jeep.

The rifle and ammunition were demonstrated at a meeting of the Cleveland ordnance post of the American Ordnance association at the Erie Ordnance depot in Lacarne.

Col. E. W. Grubbs, commanding officer of the depot, said the BAT is capable of knocking out the largest and most powerful tanks.

The weapon was developed by Frankford Arsenal of Philadelphia, with the assistance of Armour Research Foundation of Illinois Institute of Technology, Chicago; the Frigidaire division of General Motors, Dayton, Ohio; Springfield Armory, Springfield, Mass., and Firestone Tire & Rubber company, Akron, Ohio.

Development work began on the rifle shortly after the start of the Korean war, but production did not start until last fall. It is now being produced by Firestone.

One of the features of the weapon is a rigidly mounted .50 caliber spotting rifle which permits greater fire control and speed in moving on a target. By firing tracers, the spotting rifle eliminates the need for a heavy and fragile optical rangefinder.

The BAT, measuring approximately 10 feet in length, can be mounted or dismounted from a Jeep or ¼-ton truck in less than a minute.

"The weapon enables foot soldiers to meet tanks on even terms for the first time," stated Channon F. Price, supervisor of one of the two groups engaged in thermodynamics research at Armour Research Foundation.

Price, who supervised development work on on the 106 recoilless rifle at ARF, said the weapon is capable of piercing the maximum anticipated armor for tanks.

WSE Applications

In accordance with the By-Laws of the Western Society of Engineers, the following names of applicants are being submitted to the Admissions committee for examination as to their qualifications for admission to membership into the Society in the various grades, i.e., Student, Associate, Member, Affiliate, etc. All applicants must meet the highest standards of character and prpfessionalism in order to qualify for admissions, and each member of the Society should be alert to his responsibility to assist the Admissions committee in establishing that these standards are met. Any member of the Society, therefore, who has information relative to the qualifications or fitness of any of the applicants listed below, should inform the Secretary's office. The Secretary's office is located at 84 East Randolph Street. The telephone number is RAndolph 6-1736.

76-54 William E. Massey, District Foreman, Commonwealth Edison Co., 72 W. Adams St.

77-54 Theodore H. Gluck, Chicago Office Manager, Panellit, Inc., 7401 N. Hamlin Av.

78-54 Theodore C. Korzeniowski, Estimating Engineer, Link-Belt Co., 2410 W. 18th St.

79-54 John G. Sainick, Assist. Mgr. Eng. Economics, Great Lakes Carbon Corp., 333 N. Michigan Av.

80-54 Charles J. Clark, Mgr., Chicago Pump & Condenser Dept., Ingersoll-Rand Co., 400 W. Madison St.

81-54 J. Kenneth Harvey, Sales Engineer, Combustion Engineering, Inc., 105 W. Adams St.

82-54 Robert E. Smith, Separations Studies Engr., Illinois Bell Telephone Co., 208 W. Washington St.

83-54 Arthur C. Braming, District Right of Way Engr., State of Illinois, Division of Highways, 160 N. LaSalle St.

84-54 Edgar W. Nelson, President, Nelson Bros., Inc., 3615 So. Morgan St.

85-54 Arthur R. Socolofsky, Sr. Engr., Acme Steel Co., Riverdale Station.

86-54 Harold R. Heckendorn, Assist. Supt., Mfg. Engrg., Western Electric Co., Hawthorne Station.

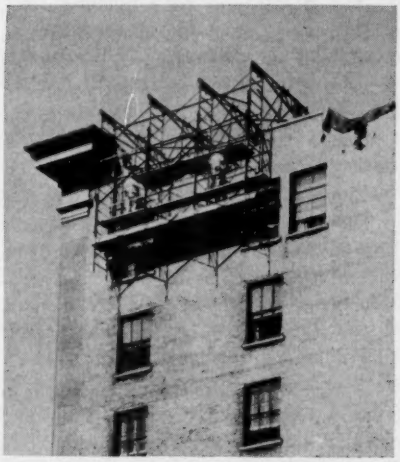
87-54 A. Newton Zahniser, District Manager, Dresser Manufacturing Division, 122 S. Michigan Av.

88-54 William J. Campbell, Assist. Dist. Engr. of Expressways, Illinois Division of Highways, 160 N. LaSalle St.

Hanging Scaffold Gives Unique Solution

Hanging a scaffold over the parapet of the Hanna Building Annex in Cleveland rather than building the scaffold up nine stories from the street was the unique solution worked out by William MacDonald, Cleveland masonry contractor. The special setup allowed him to replace 12,000 bricks, enough for a three-bedroom house, on each side in about five weeks. He figures the new rig will save him about $1,500 and eliminate 90 per cent of the scaffolding ordinarily needed for such a job.

MacDonald's problem was to remove and replace the brick on a parapet where mortar had disintegrated causing the parapet to lean inward. The scaffold consisted of a 21ft. x 14ft. tower made up of Waco Steel scaffolding on the roof with 22′ out-riggers cantilevered out over the parapet. From the outriggers were hung 30″ wide Waco ladder frames held together with toggle pins and spaced with pivoted cross braces. These frames, which extended 19½′ down, were planked and the sides and back of the entire hanging portion of the scaffold were enclosed with chicken wire for safety. Counterbalance for the hanging part of the scaffold was 4000 lbs. of



sand bags placed on the scaffold on the roof 15′ back from the parapet. The entire unit rolled on casters over boards laid on the roof.

The advantages of this type of scaffolding, according to MacDonald, are:

1. A very substantial saving in the amount of equipment needed for the job.

2. Being able to move scaffolding freely along the wall despite the variations in parapet height from three to 10 feet.

3, Workmen feel safer on it than on other styles of suspension.

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Reviews of Technical Books

Structural Design

Structural Design in Reinforced Concrete, by C. D. Williams and C. E. Cutts, The Ronald Press Company, New York, N. J. First Edition, 1954. 308 pages.

This textbook is intended for use in a basic course in reinforced concrete design for civil engineering and architectural students. Design formulas are derived and used throughout the text. However, each phase of design is approached from a fundamental viewpoint and developed from basic concepts in order to encourage independent thinking by the student and to avoid a dependence upon formulas.

The text begins with a chapter on plane concrete, includes chapters on moment distribution, bending, bending and direct stress, retaining walls and footings, miscellaneous structures, prestressed concrete, concrete construction and design for ultimate stress. The appendix contains design tables, nomographs and charts.

The textbook contains much that is not usually found in other textbooks on the same subject. Several sections are devoted to bending and bending and direct stress about two axes. A series of design curves in the appendix are also devoted to this subject. The design of a T-beam utilizes the principle of maximum-minimum moment and shear diagrams. The design of arched structures, box culverts, both ordinary and prestressed reinforced circular tanks are discussed. The short chapters on prestressed concrete and ultimate design constitutes a good introduction for the subject.

Noteworthy omissions of the text are the subjects of two-way and flat slabs. It is assumed that the authors did not wish to include any thing in the text that could not be developed from the basic concepts of mechanics presented is an undergraduate course in strength of materials.

B.A.W., W.S.E.

Thermodynamics

Thermodynamics by Franklin P. Durham, Prentice-Hall, Inc., New York, 1954, 312 pages, illustrated, price $7.35.

This volume presents the basic theory of Thermodynamics in terms of a minimum number of simple equations in order to focus the student's attention on the important relations. It introduces the concept of stagnation conditions in steady flow processes and stresses their use.

The volume is divided into fourteen major chapters covering fundamentals, types of energy, properties of thermodynamic media, the first law, the second law, the ideal gas, processes, engine cycles, vapor power cycles, refrigeration, nozzles and jet propulsion, mixtures, gas dynamics and heat transfer.

This text seems most suitable for use in an introductory course for nonmechanical engineering students.

L. G. McD., W.S.E.

Engineering Thermodynamics

Principles of Engineering Thermodynamics, by Paul J. Kiefer, Gilbert F. Kenney, and Milton C. Stuant, John Wiley & Sons, New York, N. Y., Second edition, 1954. 539 pages, illustrated. Price $7.75.

Since the publication of the first edition of this book in 1930, advances in thermodynamic concepts have necessitated a complete revision. The second edition has retained however, the basic features and approaches of the original. The thermodynamics of compressible and high-velocity flow with mechanical, chemical and aerodynamical applications directly applicable to modern engineering practice is incorporated in the volume in an up to date manner.

Principles of engineering thermodynamics are emphasized to implant a recognition both of the ideal capabilities and of inherent limitations of power-plant and similar equipment. The nature and consequences of the inescapable departures from the ideal in actual operating installations are considered. Part I of the volume is concerned with the classification and accounting of energy with major chapters on energy in transition, stored energy and energy equations. Part II, The Availability of Energy, contains chapters on reversible processes and cycles, the Carnot principle, the absolute temperature scale and entropy. Part III deals with properties of fluids including solid, liquid, and vapor states, ideal gases, low-pressure gas and gas vapor mixtures, non-ideal gases and vapors and combustion. Part IV concludes with engineering applications covering power-generation cycles for condensing and non-condensing fluids, heat pump and refrigeration cycles, flow of compressible fluids, and dynamic forces in turbines and jets. The text makes excellent use of illustrative problems. The scope of the text is such that it is recommended particularly for work in advanced topics in thermodynamics rather than as a text for a first course in thermodynamics.

L. G. McD., W.S.E.

Soil Mechanics

The Mechanics of Engineering Soils, by P. L. Capper and W. F. Cassie, McGraw-Hill Book Co., Inc., New York, N. Y., 1953, XVI. 315 pages. Price $6.50.

This second edition has been expended somewhat to include certain additional Soil Mechanics data. The book includes a rather complete but brief coverage of the principle methods and theories in Soil Engineering. Procedures of some methods are described in considerable detail and nearly all of the better known theories of Soil Mechanics are given some consideration.

The book does not go into the applications and limitations of the theories and methods of analyses presented but as an introduction to the subject it is one of the best books in this field.

E.V.

Steps Taken Curtail Air Pollution

Citing the many millions of dollars spent by his own company, by the petroleum industry, by U.S. Steel and others, William R. Chalker, of the Engineering Service Division, of the E.I. du Pont de Nemours & Co. Engineering Dept., stated Oct. 20 in New York that "industry has taken long strides forward in curtailing its air pollution."

Addressing the convention of the American Society of Civil Engineers, he said:

"As of 1953, the expenditures of the petroleum industry had reached $14,000,000 for control facilities in the Los Angeles area alone. The United States Steel Company announced some time back that the cost of pollution abatement facilities for its new Fairless Works would cost $8,000,000. The du Pont Company has spent or authorized some $14,000,000 on air pollution reduction facilities alone, not to mention an additional $21,000,000 on liquid waste control. These are impressive figures. It would be intriguing to know what the present outlay for air pollution abatement facilities is in our country. It must be enormous.

"In addition to its own research, industry is supporting investigations made by private research organizations and by universities. Through trade organizations such as the Manufacturing Chemists' Association and American Petroleum Institute, industry has been pooling the results of its experience and knowledge of air pollution and its abatement.

"It should be recognized that some of these abatement problems are difficult and that their solution will be slow. Industry, however, is of the opinion that it can solve its air pollution problems in the same orderly manner that has led it to crack many of its other difficult technical problems."

Observing that "industry is aware of its share of air pollution," Chalker said:

"Industry is spending large sums of money on facilities to catch its dusts and control its gaseous wastes. In the earlier days of air pollution, problems were solved as they were recognized, which was frequently not until complaints were received from the neighbors. Today, the rule is for a more positive approach to air pollution abatement. The du Pont management has recognized the problem and has provided a place for its consideration in all stages from site selection."

Chalker pointed out that the du Pont Company has a group of specialists "who work on problems involving air pollution, weather and allied subjects" and that it is this group's task "to anticipate where air pollution problems might originate and to avoid them while the plant is still on paper."

Extensive studies are made when the company goes into a new community so that engineering design and construction may proceed on lines intended to prevent air pollution.

Chalker commented that "it has not been so many years ago that a smoking chimney and a sooty atmopshere were looked upon as signs of prosperity" but that today "such unsightliness is no longer considered desirable." He said that the broad study of air pollution and its abatement "engaged the time and energy of a great many persons of many abilities," among them being meteorologists, analytical chemists, physicists, toxicologists, physicians and all branches of engineering."

It Floats...

Second Engineer: "What did you do when your ship sank in the middle of the ocean?"

First Engineer: "I just grabbed a bar of soap and washed myself ashore."

Industrialist Writes On Soviet Engineer

The Soviet technical and scientific educational system appears to be "turning out an exceptionally intelligent and highly educated group of engineers and scientists at a faster rate than we are training their opposite numbers in the United States," an American industrialist has declared.

Writing in the August issue of the *American Engineer*, official publication of the National Society of Professional Engineers, J. D. A. Morrow, president of the Joy Manufacturing Company, sizes up Russia's technological expansion in recent years.

Along with a numerical superiority in engineering graduates, it also appears that "the Soviet graduates represent a higher level of scholarship than do ours," Morrow stated.

Basing his conclusions on material in published sources both in Russia and in this country, as well as on engineering contacts made by his firm abroad, Morrow describes the life of an engineer in Russia as one where he may be given a Stalin Prize for a successful new machine, but if the machine does not work he may be given three days to "make it work or else."

"There have been so many 'or else' cases, in which ambitious engineers or scientists suddenly and permanently vanished, that there is a definite tendency on the part of Soviet engineers to seek security first," the author said.

Morrow quotes figures on coal, steel, and electricity which, he states, show "the picture of a nation gearing its

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economy to preparation for war on a tremendous scale."

The author cites one Soviet evaluation of their coal industry, however, as strictly a piece of glittering propaganda designed to impress Nehru and the people of India with the alleged miracles of Soviet industry and the heaven of Russion Communism."

Morrow states that an analysis of the best Soviet coal production indicates that Russia is still far below that of even the average American mechanized mine.

Russia's best industrial showing "is in the manufacture of machine tools and transportation equipment, where the man-year productivity is about 75 per cent of that in the United States," he continues.

"In general, the poorest Soviet performances are found in the textile, sugar refining, paper, cement, chemical, building, and consumer fields," he said.

Morrow describes the current growth of the Soviet industrial plant as based chiefly on a ruthless exploitation of the rural population, and on a single-minded concentration on the recruitment and training of technological workers.

The great discrepancies in the earning power of employees in various industries have set up stresses which are "adversely affecting their overall efficiency and progress," Morrow declared.

The author looks at competition as "more ruthlessly applied in Soviet life than anything that our free enterprise system presents."

"In the U.S.S.R. the chief function of the government-controlled labor unions is to set norms of production for every worker," and in industry and science "competitions are constantly held," Morrow stated.

Wanted—"Q.E.D.'s." Apply Now

Enlisting the aid of industry, science and the individual inventor in this country's defense effort, the U. S. Department of Commerce has announced publication of a list of 200 technical problems confronting the armed forces. Entitled *Technical Problems Affecting National Defense,* the new publication was compiled by the Department of Commerce's National Inventors Council with the aid of the three military services.

Commenting on the publication, Lawrence Langner, secretary of the Council pointed out that the Department of Commerce serves as an effective bridge between the inventive public and the technical needs of military groups. "It is thus particularly appropriate," he said "that Commerce Department's National Inventors Council act as disseminating agency for these military problem lists."

The National Inventors Council was founded in 1940 to serve in the Department of Commerce as a clearinghouse for ideas, suggestions, inventions, and developments that might be useful to the armed services in the war effort. From over 300,000 proposals examined by the Council, thousands have been referred to military agencies. Many of these proposals have resulted in incalculable savings in men, material, time, and money.

The list contains some 70 new problems, along with about 130 carried over from previous lists. It is designed to direct the attention of inventors, scientists, engineers, technicians, and research groups to specific problems facing the military, as well as more general problem areas where technological advances are desirable.

Typical problems in the field of electronics include development of a long-life battery for use in wide temperature ranges, a coaxial r-f switch, miniature hermetically sealed transistor cartridges, and a precision method for growth of large single silicon crystals. Metal problems include a protective coating of magnesium alloys, machinery for fabricating and welding titanium, and a metal-to-metal adhesive. The search for new materials includes a substitute for jute in sandbags and a substitute for wolverine fur in cold-weather garments. Typical of food needs are canned meat and seafood items with a storage life of at least a year.

A challenging plastic problem is a liquid that will return a scratched and hazy acrylic plastic surface to its original clear state. Quick-cure casting resins and high-temperature molding compounds are also sought. Other problems include a soil-stabilizing additive, airspeed and altitude indicators for helicopters, and a design for cold-weather sleeping gear that will allow men to change position and prevent them from breathing into the bag.

Solutions to these problems, or ideas that might lead to solutions, may be submitted to the National Inventors Council where they will be examined and evaluated. Those which show promise will, on Council recommendation, receive further study or investigation from appropriate military groups.

Copies of the publication are available free of charge from the National Inventors Council, U. S. Department of Commerce, Office of Technical Services, Washington 25, D. C.

No special forms are required for submitting proposals to the Council, and the services of an attorney are not necessary. However, it is suggested that each proposal be submitted as a separate document, typewritten if possible. The description should be as nearly complete as the inventor can make it and might well include (1) some reference to the principles underlying the apparatus, (2) a discussion of any experimental work or tests that have been conducted, and (3) the particular points of novelty or superiority of the invention as compared to existing devices or practices. The written material may be supplemented

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by any sketches or drawings the inventor wishes to include, but these drawings need not be professionally done.

The problem list is not issued in an attempt to locate firms or organizations interested in obtaining development contracts, as Council activities do not include assistance in this area. Such firms should communicate directly with the appropriate technical branch of the military. Neither is it intended to locate products that are already widely available on the domestic market, as the armed services are usually aware of these. Manufacturers with products of potential interest to the military should normally approach the armed services through regular procurement channels.

Following are subject titles of many of the new list of problems and their designated number.

519 New or improved carburetion of air-intake system
520 Development of air inlet and exhaust grills.
521 Device for prevention of snow and ice deposit
522 Packings and lubrication for oxygen compressors
523 Oxygen storage cylinders
524 Aircraft air compressor
525 Mechanical placing of barbed-wire entanglements
526 Concealment studies for combat vehicles
527 Increasing turbine fuel economy
528 Shock absorber
529 Gas driven servo
530 Dirt immune hydraulic valves
531 Quick disconnect
532 Long life batteries
533 Detection of buried explosives
534 Radio-proof blasting cap
535 Microwave oscillator
536 Efficient, compact, light, quiet power source
537 Recorder for high frequency range
538 Coaxial r-f switch
539 Frequency insensitive rotating joint
540 Presenting three dimensional information
541 Microwave direct storage or memory circuit
542 Non-hetrodyning type of frequency divider
543 Hermetically sealed cartridges
544 Growth of large single crystals
545 Semi-conductor material
546 Electro-chemical stability
547 High resistance material
548 Casting resins
549 High temperature molding compound
550 Coil impregnants
551 Lead acid battery case
552 Improved elastomers
553 Soil additive
554 Substitute material for sandbags
555 Substitute for wolverine fur
556 Cleaning process to remove deposits from turbine blades without disassembly of engine
557 Resurfacer to eliminate haze and scratches in acrylic plastic surfaces
558 Smokeless rocket propellents
559 Long-burning time solid propellents with ability to be throttled
560 High strength / high temperature materials and methods of fabricating them
561 Metal to metal adhesive
562 Protective coating for magnesium
563 Method of floating sodium fluorescin dye in water
564 Arresting hook material
565 Ambient temperature measurement
566 Ambient humidity measurement
567 Rugged portable lightweight ammeter
568 Carbon monoxide indicator
569 Underwater acoustic transducer
570 Improved or new type commutating and decommutating for telemetering
571 Flux meter
572 Pre-stress measurement in nut and bolt assemblies
573 Non-destructive tester
574 Simple, light-weight, and producible inertial components; gyros, accelerometers, computers, etc.
575 Supersonic radome
576 Homing navigation system
577 Trajectory indicator
578 Helicopter attitude indicator
579 Helicopter airspeed indicator
580 Increasing helicopter stability
581 Landing gear
582 Decreasing helicopter noise
583 Reducing helicopter vibration
584 Helicopter controls
585 Missile design
586 Design of cold weather field sleeping gear

In addition to the new items on the new list as indicated above, many items from previous listing remain of active interest to the Armed Forces.

On Cheerfulness

Cheerfulness is the friend and helper of all good graces, and the absence of it is certainly a vice.

—Aughey

Natural Gas Home Study Course Offered

A home study course in natural gas production and transmission—designed for utility gas industry employes from newcomers to executives—is being offered by the Institute of Gas Technology, Chicago.

"Well over 900 copies of the text for the course have been distributed since it was initiated less than two years ago," according to Capt. E. S. Pettyjohn, MWSE, vice-president and director of the gas institute.

"Approximately 900 employes of 119 gas companies of the United States and Canada are taking the course or have completed it and received their certificates of accomplishment," he explained.

The Institute of Gas Technology, an affiliate of Illinois Institute of Technology, is the utility gas industry's own educational and research facility.

Subject matter for the texts has been planned so it can be understood by persons with little or no training in the fields under discussion, Pettyjohn pointed out.

"However, the coverage of all subjects is sufficiently comprehensive that the courses can be integrated with cadet engineering programs and can serve as refresher courses for more experienced utility personnel," he added.

Chemical, physical, engineering, and geological fundamentals are offered early in the course to aid those who have had no instruction in one or more of these subjects.

The student then progresses throughout each phase of production, gas conditioning, and transmission.

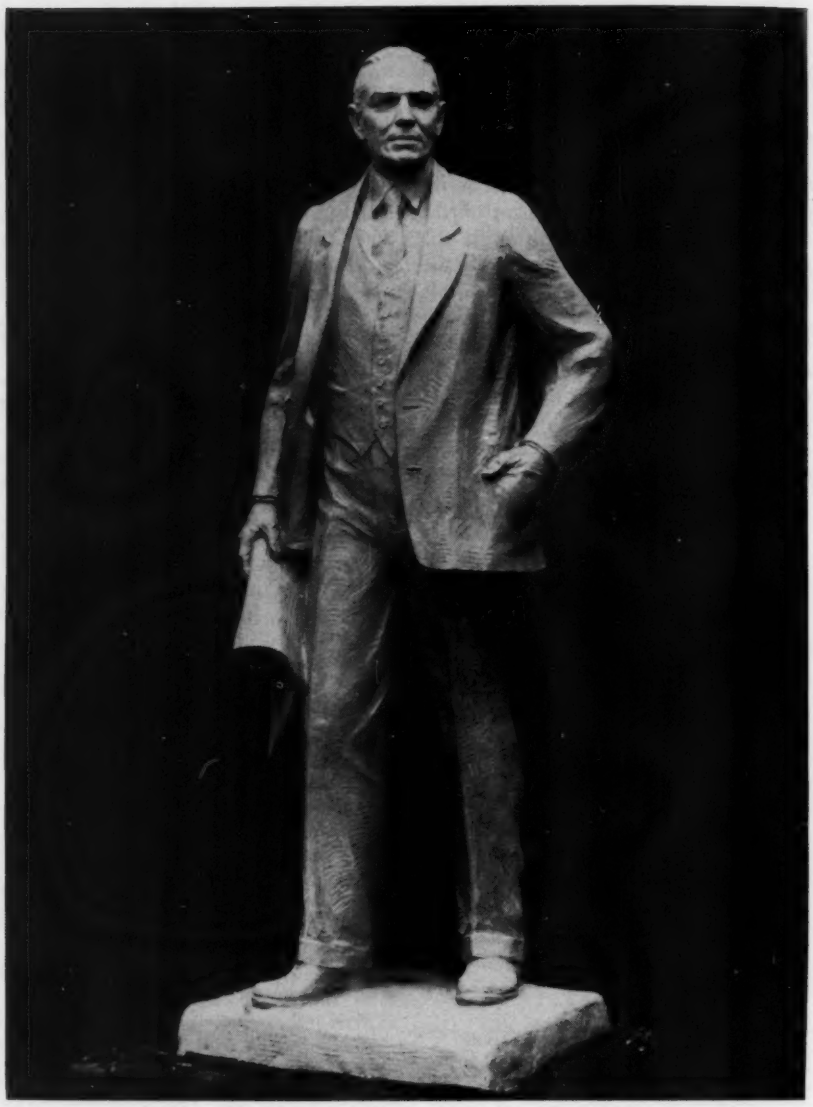
"Sound engineering has always been wedded to economics," Pettyjohn said, "and their relationship is maintained in this course.

"Economic and legal aspects of certain operations are discussed in the chapters dealing with those operations."

The closing chapters contain information essential to an understanding of business activities and problems of natural gas companies.

The course is offered under several plans to suit the needs and circumstances of individual enrollees and to fit into employe training programs of companies.

Daniel C. Jackling Is Honored



Four-foot model of statue to honor Daniel C. Jackling, MWSE.

Daniel C. Jackling, a member of the Western Society of Engineers and recipient in 1940 of the Washington Award, is being honored by the placement of an eight-foot statue of him in the rotunda of the Utah State Capitol. Mr. Jackling, an internationally known mining engineer, founded the Utah Copper Co.

Avard Fairbanks, who heads the University of Utah School of Fine Arts, is the creator of the statue. It was commissioned by the Sons of Utah Pioneers, Jackling Memorial Committee. The directors of the Kennecott Copper Corporation made the statue possible by the appropriation of $35,000 for the project. The picture shown here is a photograph of the four-foot scale model.

Known in the industry as "Father of the Porphyries" in recognition of his great accomplishments regarding the first great low-grade copper operation, Mr. Jackling is one of the most noteworthy figures in the development of the copper industry. His theories of mass mining and processing, some developed 50 years ago, are still used at the present time throughout the world. Undeterred by those who said that such low-grade ore could not be mined profitably, his great vision created one of the world's largest copper mines.

Besides founding the Utah Copper Company, Mr. Jackling played an important part in the operation of the Nevada Consolidated Copper Company, Ray Consolidated Copper Company, and Chino Copper Company, not to mention a number of other corporations of industry. Now retired from his activities with most of these organizations, Mr. Jackling lives near San Francisco.

WSE Personals

F. H. Lane, a past-president of WSE, was honored recently by a special issue of *Pioneer Shield*, published by Pioneer Service & Engineering Company. Following is a reprint of an article from the *Shield*:

"Fifty years ago this month (September) a freshly graduated engineer from I. I. T. went to work for H. M. Byllesby in the drafting room at the agreeable salary of $480 a year.

"Fifty years later this lad had become a man of stature and eminence in the engineering field and in the hearts of all who knew him. But enough of the past tense. Howard Lane is still with us and we take this occasion to honor him upon the completion of half a century with our company. He is the oldest employee in length of service in our company, and if we trace its remarkable history back over its ever-changing paths of fifty-two years, we would find Howard Lane's name about seventh from the beginning, from that of Mr. Byllesby himself, the founder.

"Once started, Howard Lane, or "F. H." as he has been known to many, climbed the ladder of success rapidly. He was not a draftsman very long, probably about two years. Then he went into the field where he did investigation work, making surveys and evaluating water power developments the Company was interested in acquiring. Next he spent several years as a construction superintendent, following which he became Manager of the Examination and Reports Department in 1915. In 1917 Mr. Lane became Manager of Engineering and Construction, a job he held for many years. As construction began to drop out of our Company's activities, about the time Byllesby Engineering and Management Company was organized, Mr. Lane found himself becoming more and more involved with administrative work. Now he is our Field Engineer, using his wealth of experience and knowledge of engineering, principally on new jobs and proposals.

"We expect the old saying, "He is a gentleman and scholar" was coined to describe Howard Lane, for he is a gentleman and a scholar in every sense of the word. Possessing a fine liberal education, he is well read in the classics, which he is fond of quoting. He can quote with equal facility the Bible, Shakespeare, Jurgen and numerous other greats on the many shelves of literature and art. His keen sense of humor is an integral part of his character; he always has a ready smile and a friendly word; he is an excellent conversationalist as well as a good listener. Those who know F. H. best, say that he was never a driver; rather a leader who engendered confidence and enthusiasm in those who worked with him. He has always been popular with our employees as well as with our clients. It is said one can always go to Mr. Lane and get a good hearing; one can talk with him and know he is being understood, leaving with encouragement and sound advice.

Professionally, Howard Lane has an enviable record, not only from his work but his unselfish service to engineering. He is a Fellow and a Life Member of the American Institute of Electrical Engineers, a Life Member of the American Society of Mechanical Engineers and the Western Society of Engineering, of which he is a past President. Registered in seven states as a Professional Engineer, Mr. Lane is now serving a second term as a member of the Illinois Professional Engineers Examination Committee.

"Any of us who find it difficult to understand what fifty years of service means would do well to become acquainted with Howard Lane. In him he will find a man with great pride in the past; an enthusiasm for the future; and an intense loyalty to his profession, his company, and to his many, many friends.

E. Gordon Fox

"Congratulations, Howard Lane, on the significant achievement of completing the fiftieth year of a distinguished career."

* * *

E. Gordon Fox, a past-president of WSE, is the new president of the Wisconsin Alumni Association.

He has been active in WSE affairs for a number of years. During the year 1938-39 he was the Society's 3rd vice-president. In 1939-40 he was 2nd vice-president. He was president of the Western Society of Engineers during the year 1940-41.

Fox is possibly best known as one of the engineers from the U. S. who in the early part of the 1930's was engaged to help promote Russian industry during a five year plan. He is also well known as an important figure in the electrical power ends of the engineering of steel mills.

Fox, after graduation from Wisconsin, served at Fort Wayne, Ind., as a

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testing engineer with the General Electric Company. Subsequently he was an erecting engineer and sales engineer. In 1914 he was given the position of electrical engineer in charge of design and construction of electrical installation for a steel mill then going up, now the Youngstown Sheet and Tube Company, Indiana Harbor, Ind.

The Freyne Engineering Company employed Fox in 1920 as an electrical engineer. He has been associated with this company and its parent company Koppers, since then. In 1952 he retired as operating manager of Freyne, and vice-president of Koppers Company. In the capacity of a consulting engineer, Fox still serves Koppers; also an engineering firm in South America.

Klopsteg Retires From Northwestern

Northwestern University has announced the retirement at age 65 of Prof. Paul E. Klopsteg, distinguished scientist and director of research at the University's technological institute. He will be remembered by WSE members as the speaker at the 1952 Annual Fall Dinner, Nov. 17, 1952.

Klopsteg has been granted the rank of professor emeritus of applied science. At present he is residing in Washington, D. C., where he has been associate director of the National Science foundation since 1951. During this time he has served as adviser to Northwestern on technological institute matters.

Especially noted for his postwar achievements in the development of artificial limbs, Klopsteg in 1948 was awarded the medal of merit with Presidential citation for his work in that field and for service during World War II as chief of a division of the National Defense Research committee and in other important governmental capacities. Granted only to civilians, the medal is considered the equivalent of the distinguished service medal in the military.

Klopsteg will continue as chairman of the National Research Council's committee on artificial limbs, a post he has held since 1945.

The inventor of many scientific instruments, Klopsteg also is one of the nation's top authorities on archery. He has written extensively on the subject and is an honorary member and former chairman of the board of governors of the National Archery association.

Before joining Northwestern's faculty in 1944, Klopsteg taught at the University of Minnesota and held several posts in private industry. During World War I he was a development engineer with the U. S. Army ordnance department.

Klopsteg was a member of the board of governors of Argonne National laboratory from 1947 to 1950 and in 1949-50 served as chairman of the board. In 1950 he was appointed a member of the security survey panel of the Atomic Energy commission, and he is now a member of the commission's security review board.

Author of several books and numerous articles in scientific journals, Klopsteg is past president of the American Association of Physics Teachers and of the Physics Club of Chicago, of which he is an honorary member. For 20 years he was a member of the executive committee of the American Institute of Physics. His seven years as chairman of that group encompassed the period of World War II.

Klopsteg's awards include the University of Minnesota outstanding achievement medal and the Modern Pioneers' award of the National Association of Manufacturers. He has honorary degrees from Northwestern and from Wesleyan University.

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